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A NEW SPECIES OF *ARACHIS* (FABACEAE) FROM MATO GROSSO, BRAZIL, RELATED TO *ARACHIS MATIENSIS*

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Summary: Valls, J. F. M. & C. E. Simpson. 2017. A new species of *Arachis* (Fabaceae) from Mato Grosso, Brazil, related to *A. matiensis*. Bonplandia 26(2): 143-149.

In the original description of *Arachis matiensis*, two isolated populations, from the municipality of Cáceres, Mato Grosso State, Brazil, were listed as possibly representing a different species, but the analysis of additional materials, and further morphological study were considered necessary to reach a decision in that regard. New herbarium and germplasm collections in the area, additional morphological studies, and inter- and intraspecific crossing results now support the description of *A. jacobinensis*, a new species of the taxonomic section *Procumbentes.*

Key words: Central Brazil, groundnut, Leguminosae, *Procumbentes*.

Resumen: Valls, J. F. M. & C. E. Simpson. 2017. Una nueva especie de *Arachis* (Fabaceae) de Mato Grosso, Brasil, afín a *A. matiensis*. Bonplandia 26(2): 143-149.

En la descripción original de *Arachis matiensis*, dos poblaciones brasileñas aisladas, del municipio de Cáceres, estado de Mato Grosso, Brasil, se destacaron como posiblemente pertenecientes a una especie distinta pero se consideró que era necesario realizar análisis de más materiales y estudios morfológicos adicionales para alcanzar una decisión en ese respeto. Nuevas colecciones de herbario y germoplasma en el área, estudios morfológicos complementarios y resultados de cruzamientos inter- e intraespecíficos sustentan ahora la descripción de *A. jacobinensis*, una nueva especie de la sección taxonómica *Procumbentes*.

Palabras clave: Brasil Central, Leguminosae, maní, *Procumbentes*.

Introduction

From 1753, when Linnaeus created the genus *Arachis* and described the common groundnut, *A. hypogaea* L., until 1991, congeneric names were validly published for 21 taxa recognized as distinct at the species level, while some additional names were subsequently included in the synonymy of *A. hypogaea*.

In the early 1990s, there was broad consensus on the existence of 22 validly published *Arachis* species. However, there was a wide range of diversity, still to be clarified and officially described and named, in the ever expanding herbarium materials, and the increasing number of germplasm accessions being incorporated into genebanks and other research institutions at that time.

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In 1994, Krapovickas and Gregory published a comprehensive monograph, which recognized the 22 species names not included in the synonymy of *A. hypogaea*, transferred three previously described varieties to the species level, and added 44 new species, while developing a systematic framework to the genus, based on nine taxonomic sections.

Herbarium specimens of the genus *Arachis* are often incomplete. Flowers, when present, tend to be wilted, and many specimens do not show the underground organs, which include the subterranean fruits (Valls et al., 1995). Thus, despite a careful analysis of the materials deposited in the world's major herbaria and in some rich regional collections, several specimens were difficult to place with confidence in the 69 species covered by the monograph. In these cases, Krapovickas and Gregory (1994) listed dubious specimens under the species they considered closest, as related materials that require further research.

More recently, Valls & Simpson (2005) added 11 new species to the genus. Three of these, *A. submarginata* Valls, Krapov. & C. E. Simpson, *A. nitida* Valls, Krapov. & C. E. Simpson, and *A. gregoryi* C. E. Simpson, Krapov. & Valls, were segregated, respectively from *A. pietrarellii* Krapov. & W. C. Greg., *A. glabrata* Benth., and *A. kuhlmannii* Krapov. & W. C. Greg., under which they had been listed in the monograph with some evidence of disagreement.

Krapovickas and Gregory (1994) also placed the collections *Valls, Simpson & Gripp 6340*, and *Valls, Krapovickas, Simpson & Silva 8910* in the species *Arachis matiensis* Krapov., W. C. Greg. & C. E. Simpson, indicating that they might belong to a different taxon, but it would be advisable to examine additional material to make a decision in that regard. Furthermore, the accession *Valls, Krapovickas, Simpson & Silva 8920* was attributed by Krapovickas and Gregory (1994) to *A. subcoriacea* Krapov. & W. C. Greg.

Since publication of the monograph, additional material has been collected in the same area where the three above-mentioned materials were found, much more study of morphology has been accomplished, and completion of cross-compatibility data have all helped clarify the relationship of these accessions to *Arachis matiensis*, and to each other. From these further studies, the following new species is identified. Herbarium acronyms follow Thiers (2017).

Arachis jacobinensis Valls & C. E. Simpson **sp. nov.**
Fig. 1, 2 A-D.

Morphologically similar to Arachis matiensis Krapov., W. C. Greg. & C. E. Simpson, but differing by the generally larger plants, larger, somewhat coriaceous, and proportionately wider leaflets, much taller mainstems, and light pink, not green calyx upper lip.

Typus: BRAZIL. Mato Grosso: Mun. Cáceres, 24 km E Cáceres (rio Paraguai), a leste de pedreira de calcário, no km 708,4 da BR-070, 16°12'46.6" S, 57°34'24.9" W, 300 m, 13-V-2015, *J. F. M. Valls, C. E. Simpson, J. L. Dilly & M. W. S. Sousa 16078* (*holotypus* CEN), i*sotypi* BRIT, CTES, K, MO, P, RB, SP, UFMT).

Perennial herb, with axonomorphic root, 2.8 (2.8-6.4) mm in diameter with horizontal branching. Mainstems 29.4 (29–35.4) cm, internodes angular in green and in dry specimen. Leaves tetrafoliolate, glabrescent, coriaceous and with short (1–2 mm) hairs on margins only. Internodes 41.9 (22.6–82.9) mm long. Main axis leaflets elliptical; basal pair more acute, 32.3 (24–58) mm long, 13.8 (11.8–29) mm wide; apical pair 35.5 (31.1–50.8) mm long, 17.5 (16.6–25.4) mm wide; petioles 40.5 (32.8–50) mm long; rachis 9.4 (8.4–13.1) mm long. Stipules 29.6 (20.2–55.4) mm long, 5.0 (4.1–7.2) mm wide, with 5 to 6 visible nerves; adnate part 13.9 (9.2–19.3) mm long; free part 15.7 (11–36.1) mm long; stipules with occasional bristles. Lateral branches angular in green and dry tissue alike. Lateral branches 6.6 (6.6–53) cm. Leaflets on lateral branches glabrous, elliptical and somewhat coriaceous in green tissue, not as evident in dried material; basal pair 24 (17.2–32.9) mm long, 11.2 (8.2–17.4) mm wide; apical pair 27.9 (17.8–41.6) mm



Fig. 1. *Arachis jacobinensis* Valls & C.E. Simpson. Plant habit, showing tall main axis (Type collection: *Valls et al. 16078*).

Fig. 1. *Arachis jacobinensis* Valls & C. E. Simpson. Hábito de la planta, monstrando el eje principal (Colección Tipo: *Valls et al. 16078*).

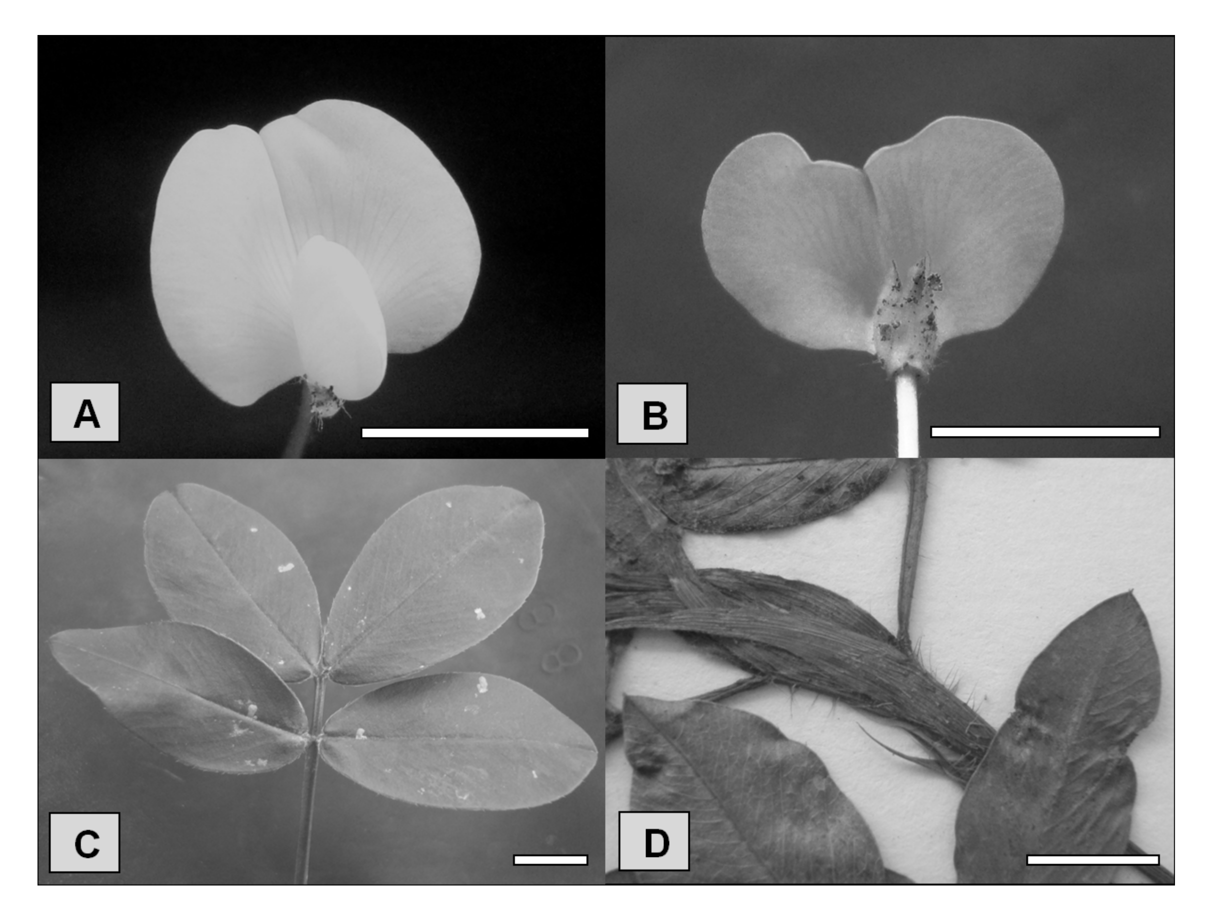


Fig. 2. *Arachis jacobinensis* Valls & C. E. Simpson. A: Flower, adaxial view. B: Flower, abaxial view. C: Leaf, adaxial view. D: Bristles at stipules. (A-B, *Valls et al. 16077* - screenhouse plants. C, *Valls et al. 8910* - screenhouse plant. D, *Krapovickas & Gregory 30033*, CEN 18831 1/2). Scale bars: 1 cm.

Fig. 2. *Arachis jacobinensis* Valls & C. E. Simpson. A: Flor, vista adaxial. B: Flor, vista abaxial. C: Hoja, vista adaxial. D: Cerdas en estípulas. (A-B, *Valls et al. 16077* - plantas en invernadero de malla plástica. C, *Valls et al. 8910* - plantas en invernadero de malla plástica. D, *Krapovickas & Gregory 30033*, CEN 18831 1/2). Escala: 1 cm.

long, 15.9 (12.1–21.4) mm wide; rachis 8.0 (5.4–13.4) mm and petioles 32 (19.9–37.1) mm long. Lateral branch stipules 18.7 (13.1–44) mm long, 4.5 (3.5–6.4) mm wide; adnate part 8.6 (5.9–16.3) mm long, 2.3 (1.7–3.6) mm wide; free part 10.1 (7.2–27.7) mm long, 2.2 (1.8–2.8) mm wide; stipules with sparse bristles. Hypanthium 3.2 to 4.8 cm long, with many short hairs on its entire length. Calyx bilabiate, lips of a light pink color, with scattered glandular hairs; upper lip 5-6 mm long, somewhat tridentate; lower lip 6 mm long. Standard petal of orange color, with some red lines on upper surface, wings yellow. Standard to 10.6 mm long, 14 mm wide. Pegs horizontal, to 18.5 cm long in dried specimens; no bristles present. Fruits subterranean, 13 x 6 to 15 x 7 mm, mostly smooth, with a very pronounced beak.

Paratypi: **BRAZIL. Mato Grosso**: Mun. Cáceres, 57 km E de Cáceres, estrada Cáceres - Cuiabá, 17-XII-1976, *Allem 741* (CEN); entrada da Fazenda Primavera, 29.3 km a sudeste de Cáceres, na BR-070, 23-VIII-1981, *Valls et al. 6340* (CEN); id., 13-V-2015, *Valls et al. 16077* (CEN); 26 km E Cáceres, a leste de pedreira de calcário no km 705 da BR-070, 29-V-1985, *Valls et al. 8910* (CEN); id., 7-XI-2001, *Valls et al. 14768*, *14769* (CEN); km 652 da rodovia Cuiabá-Cáceres, 7 km a leste do rio Flechas, 29-V-1985, *Valls et al. 8920* (CEN, CTES).

Related materials, with prominent bristles to 2.5 mm on stipules, and even on petioles and leaflets: **BRAZIL**. **Mato Grosso**: Mun. Cáceres, 37 km E de Cáceres, camino a Cuiabá, Serra das Araras, 17-XII-1976, *Krapovickas & Gregory 30033* (CEN, CTES, K, MBM, MO, NY, P, SP). **São Paulo**: Mun. Campinas, Fazenda Santa Elisa/IAC (cult. ex *Krapovickas & Gregory 30033*), 26-IV-1977, s. col., s. n. (CEN 1093, CGMS 39046, RB 375456, UB 140950).

Chromosome number: 2n=20, satellited chromosome type 9, in the collection *Valls et al. 6340* (Fernández & Krapovickas, 1994).

Geographic distribution: So far, only known from the municipality of Cáceres, in Mato Grosso State.

Obs. 1: The above-ground growth of this species presents some morphological resemblance to *A. matiensis* of the taxonomic section *Procumbentes* Krapov. & W. C. Greg. The root system associates the new species with that section. However, there are five distinguishing characters that include: 1. Apparently tridentate calyx upper lip, with a very short notch in the central tooth formed by two sepals, whereas in *A. matiensis* it is more evidently tetradentate; 2. Calyx of a light pink color, not green; 3. Leaflets larger and somewhat coriaceous; 4. Main axis taller than *A. matiensis;* 5. Plants of *A. jacobinensis* are generally larger than those of *A. matiensis.*

Obs. 2: Herbarium specimens of the 1976 collection *Krapovickas & Gregory 30033*, from near Paiol, along a now abandoned stretch of the old Cáceres – Cuiabá dirt road, in the same general area of *Valls et al. 6340* and *8910*, have been widely distributed, and duplicates at CEN, K, MBM, MO, NY, and P are available as high resolution pictures in the *Species Link* (*http://splink.cria.org.br/*) and *Reflora Virtual Herbarium* (reflora.jbrj.gov.br/reflora/herbarioVirtual/) databases. They all show prominent bristles to 2.5 mm on stipules, and even some on petioles and leaflets. At the CTES herbarium, *Krapovickas & Gregory 30033* is filed as three duplicates, with the herbarium codes CTES 17808A, B, and C. However, the specimen CTES 17808C corresponds to a very distinct plant, with much more narrow leaflets, that we do not accept as the new *A. jacobinensis*. Live plants of the *30033* collection were kept and increased by Dr. Antonio S. Pompeu in the Santa Elisa Experimental Farm of the Agronomic Institute, Campinas, São Paulo State, Brazil, from where a set of herbarium specimens was prepared on 26 April 1977, by José G. A. Vieira, of the Embrapa Cenargen herbarium (CEN), and additionally distributed to CGMS, RB, and UB. Labels do not inform the collector's name and identify the specimens as cultivated from W. C. Gregory 30033, missing the name of the first collector. These specimens also show the prominent bristles on stipules.

Obs. 3: When *A. jacobinensis* was crossed with *A. matiensis* (accessions *Valls et al. 6345*, from the same site of the type collection, and *Valls et al. 6407*), the hybrids had a mean stained pollen count of 48.2%; with three accessions of *A. appressipila* Krapov. & W. C. Greg., 27.2%, with *A. rigonii* Krapov. & W. C.Greg., 78.1%; and with *A. pintoi* Krapov. & W. C. Greg., of the section *Caulorrhizae* Krapov. & W. C. Greg., 17.2%. Hybrids between two accessions of *A. jacobinensis*, *Valls et al. 8910* and *Valls et al. 6340*, had a mean pollen count of 60.0% (4 plants, range of 44 to 66%). It is worth noting the very high pollen counts obtained in crosses with *A. rigonii*, the type-species of section *Procumbentes*.

Obs. 4: Koppolu et al. (2010) studied the genetic relationships among species of seven taxonomic sections of the genus *Arachis* by using SSR markers, including the accession *Valls et al. 8920*, identified as *A. subcoriacea* (Krapovickas & Gregory, 1994), and under the ICRISAT, India, denomination ICG 15156. This accession, that we consider to be *A. jacobinensis*, grouped with 10 accessions of *A. appressipila*, *A. chiquitana* Krapov., W. C. Greg. & C. E. Simpson, *A. kretschmeri* Krapov. & W. C. Greg., *A. matiensis*, and *A. rigonii* in Koppolu's Cluster III, exclusive of species of the section *Procumbentes*. The obvious morphological similarity to *A. matiensis*, the recent crossing results, that involved the accessions *Valls et al. 6340* and *8910*, and the satellited chromosome classified as type 9 of the accession *Valls et*

al. 6340 (Fernández & Krapovickas, 1994) reinforce the assignment of *A. jacobinensis* to section *Procumbentes*.

Obs. 5: Nelson et al. (1989) tested the resistance/susceptibility of a series of wild *Arachis* accessions to *Meloidogyne arenaria* race 1, in greenhouse and field trials, including three accessions of section *Procumbentes*, respectively *Valls et al. 6340* (*A. jacobinensis*) and *Valls et al. 6407* (*A. matiensis*), both characterized as resistant (R) in greenhouse tests, while *Gregory et al. 10034* (*A. rigonii*) was found to be moderately susceptible (MS) in field tests.

Obs. 6: Fávero et al. (2005) tested the rooting performance from petioles of detached leaves of 130 accessions and 27 interspecific hybrids of wild *Arachis* species representing eight taxonomic sections. This rooting capacity of many wild *Arachis* species facilitates cytological research (Fávero et al., 2004), especially of materials with low seed production, and sterile hybrids. While the species of the section *Arachis* presented the highest precocity, showing the highest rate of rooting leaves among the sections studied, section *Procumbentes*, along with three other sections, displayed the latest or non-rooting rates. Average results compiled for section *Procumbentes* were of 16.7 and 33.9% rooting of detached leaves, respectively at 31 and 49 days. However, the *A. jacobinensis* accession *Valls et al. 8910* rated well among the 14 accessions or hybrids of section *Procumbentes*, with 25% of its detached leaves rooting from petioles at the 31st day checking, and 50% at 49 days.

The new species is named after its area of known occurrence, centered around the old Jacobina Farm, at Serra das Araras, east of Cáceres, Mato Grosso State. This is an area of limestone hills covered with low forest.

Materials studied of Arachis matiensis (selected specimens): **BOLIVIA**. **Santa Cruz**: Prov. Sandoval, San Matías, 1 km N de San Matías, 16°21'S, 56°26'W, 170 m, 21-IV-1980, *Krapovickas et al. 36014* (CTES – holotype, MO – photo, SP – photo, isotypes); mesmo local da coleta *Krapovickas et al. 36014*, ao norte da praça de San Matías, na estrada para San Francisco, 24-VIII-1981, *Valls et al. 6345* (CEN); 1 km W del aeropuerto, 17-IV-1980, *Krapovickas et al. 36007* (CEN, MBM - photo); aeropuerto, 18-IV-1980, *Krapovickas et al. 36008* (CEN, MBM - photo). **BRAZIL. Mato Grosso**: Mun. Cáceres, jardim em frente ao aeroporto, cult., 140 m, 31-VIII-1981, *Valls et al. 6409* (CEN); 39 km de Cáceres, na rodovia que vai para San Matías (Bolívia), 84 m, 29-VIII-1987, *Lleras et al. 2446* (CEN); 49 km a noroeste de Cáceres (desde o rio Paraguai) na estrada para Porto Esperidião, 220 m, 25-VIII-1981, *Valls et al. 6356* (CEN 10977 1/2 and 2/2). Mun. Cuiabá, jardins da Universidade Federal do Mato Grosso, 20-VIII-1981, *Valls et al. 6324* (CEN 19425 1/2 and 2/2, CTES). Mun. Glória d'Oeste, 9.7 km a leste do Rio Jauru e 800 m a leste do Córrego das Pitas, ao longo da BR-070, 240 m, 28-IV-1995, *Valls et al. 13764* (CEN). Mun. Porto Esperidião, lado oeste da Igreja da Assembléia de Deus, 260 m, 24-IV-1995, *Valls et al. 13708* (CEN); 124 km a NW de Cáceres, ao longo da rodovia BR-174, rumo a Pontes e Lacerda, altura do km 124, 190 m, 11-V-1986, *Allem & Werneck 3524* (CEN); 33 km NW de Porto Esperidião [Obs: Site belonging to Cáceres at the time of collection], 170 m, 30-VIII-1981, *Valls et al. 6407* (CEN). Mun. Várzea Grande, 1,5 km ao sul da rodovia dos Imigrantes, ao longo da estrada para Praia Grande (MT-140), 182 m, 4-XI-1986, *Valls et al. 10468* (CEN).

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